This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

FORESTRY
SD
254
.Y2
A2
1903-1904

BUHR A
a39015 01800072 2b

YALE UNIVERSITY

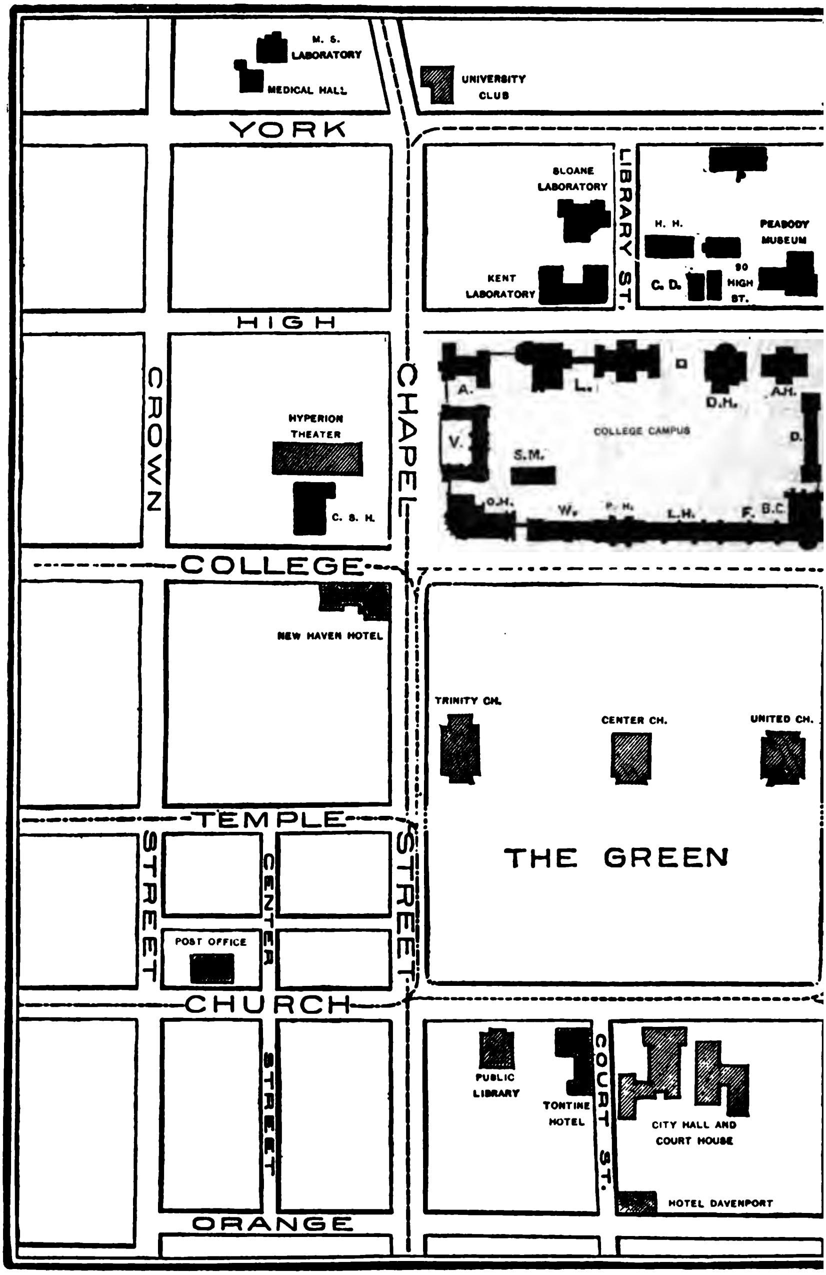
Department of Forestry

(YALE FOREST SCHOOL)

1903–1904

New Haven
THE TUTTLE, MOREHOUSE & TAYLOR COMPANY
1903

LOCATION OF THE YAL



DEPARTMENT OF FORESTRY
(YALE FOREST SCHOOL)

GOVERNING BOARD

ARTHUR TWINING HADLEY, LL.D., PRESIDENT

HENRY SOLON GRAVES, M.A., *Director, and Pinchot Professor of Forestry*

WILLIAM HENRY BREWER, LL.D., *Professor of Agriculture, Emeritus*

GIFFORD PINCHOT, M.A., *Professor of Forestry*

JAMES WILLIAM TOUMEY, M.S., *Professor of Forestry*

ADDITIONAL INSTRUCTORS

ALFRED AKERMAN, M.F., *Instructor in Forestry*

ROY LEON MARSTON, M.F., *Instructor in Forestry*

ARTHUR HARMOUNT GRAVES, B.A., *Assistant in Forest Botany*

WALTER MULFORD, F.E., *Assistant in Forestry*

SAMUEL LEWIS PENFIELD, M.A., *Professor of Mineralogy*

LOUIS VALENTINE PIRSSON, M.A., *Professor of Physical Geology*

ALEXANDER WILLIAM EVANS, M.D., PH.D., *Assistant Professor of Botany*

SAMUEL EBEN BARNEY, C.E., *Assistant Professor of Civil Engineering*

JOHN CLAYTON TRACY, C.E., *Assistant Professor of Structural Engineering*

EDWARD AUGUSTUS BOWERS, LL.B., *Lecturer in Forest Law*

WILLIAM EBENEZER FORD, PH.B., *Assistant in Mineralogy*

ARTHUR LYMAN DEAN, PH.D., *Assistant in Plant Physiology.*

WILTON EVERETT BRITTON, PH.D., *Lecturer in Forest Zoology and Entomology*

ANDREW DELMAR HOPKINS, PH.D., *Lecturer in Forest Entomology*

HERMANN VON SCHRENK, PH.D., *Lecturer in Diseases of Trees*

FREDERICK HAYNES NEWELL, B.S., *Lecturer in Forest Hydrography*

HARRY DONALD TIEMANN, M.E., M.F., *Engineer assisting in the Wood Testing Laboratory*

MRS. GEORGENE LOUISE MILLER, *Librarian and Clerk*

ENDOWMENT

The Yale Forest School was founded in the spring of 1900 by the gift of $150,000 from Mr. and Mrs. James W. Pinchot and their sons, Gifford Pinchot and Amos R. E. Pinchot. The gift provides for the establishment of a department in the University to be known as the Yale Forest School, for instruction and research in Forestry. The gift also provides for a Summer School of Forestry at Milford, Pike County, Pennsylvania, on the estate of Mr. James W. Pinchot, who has placed a building and his woodland at the disposal of the Forest School for twenty-one years.

The endowment of the School was increased in the spring of 1903 by an additional gift of $50,000 from Mr. and Mrs. James W. Pinchot, and Mr. Gifford Pinchot.

EQUIPMENT

Marsh Hall, the house of the late Professor Othniel C. Marsh, 360 Prospect St., is used as the School building. It is equipped with lecture rooms, a library and reading room, botanical and wood-testing laboratories, an herbarium and a forest museum.

The library contains about three thousand books and pamphlets and is being enlarged as rapidly as the funds of the School permit. In the reading room about forty periodicals are placed at the disposal of the students. These periodicals include the important lumber journals, botanical journals, and the technical forest journals published in this country and abroad.

The herbarium consists of more than three thousand specimens of native and foreign trees and shrubs.

The forest museum contains collections of wood specimens representing all the species of trees in the United States and Canada, besides many specimens of South and Central American, West Indian and Philippine woods. A large collection of saws, axes and logging tools is a feature of the museum.

The Yale Botanical Garden, covering ten acres, in which Marsh Hall is located and which contains a large variety of trees and shrubs as well as ample greenhouses, is used by the students of the School in botanical work and for experiments in tree-planting.

Through coöperation with the Sheffield Scientific School and the Peabody Museum, the use of their scientific collections is extended to the Forest School.

The School is thoroughly equipped with instruments for field work, including compasses, levels, plane tables, barometers, calipers, log rules, height measures, chains, tapes and other instruments used in practical forest work.

The field work during the first year and the first half of the second year is conducted in the forests near New Haven. The most important tract devoted to this purpose is Maltby park, an area of about four hundred acres, the use of which has been granted to the School by the New Haven Water Company. A large amount of experimental work in forestry is conducted on this tract by the School. Ample facilities are afforded the students for research work in the woods in Silviculture and Forest Mensuration.

The courses have been so arranged that the entire spring term of the second year is spent in the field. The spring of 1902 was spent on the tract of Mr. Edward H. Harriman in Orange County, N. Y. In 1903 the work was conducted on the Government Military Reservation at West Point, N. Y. In 1904 the spring work of the Senior class will be carried on at Milford, Penn., where the Forest Experiment Station of the University and the Summer School of Forestry are located.

DEGREE

Graduates of the Forest School, who have previously received Bachelors' degrees from collegiate institutions of high standing, or have had a training which in the judgment of the Corporation is equivalent to that obtained in such institutions, will be granted the degree of Master of Forestry.

Those who enter by examination or as special students are granted all the privileges of the School. Upon completing the course they are given a certificate of work, but not the degree of Master of Forestry. In all cases a residence of at least one year is required for the degree.

SPECIAL STUDENTS

Under exceptional circumstances students who are not candidates for a degree, but who can show their fitness to pursue the courses given in the Forest School, are admitted without examination. It is, however, the policy of the Governing Board to encourage students to take the full course, rather than a special or partial course. Those students who wish to take a short course in Forestry, and are unable to pass the entrance examinations to the Yale Forest School, are advised to avail themselves of the privileges offered by the Summer School of Forestry at Milford, Pennsylvania, which is intended to meet their special requirements.

TERMS AND VACATIONS

There are two terms in each year. The fall term of 1903 begins on Thursday, September 24th, and continues twelve weeks ending Wednesday, December 16th. The second term begins Wednesday, January 6th, and continues until Commencement, with a recess at Easter beginning Wednesday, March 30th, and ending Thursday, April 14th. The fall term of 1904 begins Thursday, September 29th.

FEES AND EXPENSES

The annual charge for tuition is $100. A special fee of five dollars is charged to those who use the gymnasium and one of two dollars for the use of the College reading-rooms.

Laboratory fees aggregating not over fifteen dollars are charged for the courses in Mineralogy, Morphology of Plants and Physiological Botany ; a fee of three dollars is charged for the course in Forest Botany, and a fee of ten dollars in Forest Technology.

Frequent excursions are taken to points of interest near New Haven, involving an annual expense of less than $15. In the spring of the second year, the work is transferred from New Haven to the field. The traveling expenses then incurred are about $25, exclusive of subsistence, which averages from $5 to $7 per week.

The fee for graduation is $5.

Satisfactory board and lodgings can be obtained in New Haven at prices ranging from $7 per week upwards.

TERMS OF ADMISSION

Applicants for admission to the Forest School must be not less than twenty years of age, and must produce certificates of good moral character.

Graduates of colleges or scientific schools of high standing who show the requisite knowledge of Botany, Geology, and Inorganic Chemistry, are admitted without examination.

Candidates who are not graduates of collegiate institutions of high standing are required to pass entrance examinations in the subjects outlined below.

1 *Mathematics.*

Calculus.—Elements of Differential and Integral Calculus, as much, for example, as is contained in Osborne's *Calculus.*

Analytical Geometry.—As much, for example, as is contained in Wentworth's *Analytical Geometry.*

2 *Botany.*

A knowledge is required of the principles of classification and of the structure of flowering plants. Candidates must be able to give the main characters of important groups of plants and to identify, by analysis, common flowering species.

3 *Geology.*

A knowledge is necessary of physiographical, lithological, dynamical, and historical Geology, as far as it is treated in general text-books of Geology. Candidates must be familiar with the influence of the atmosphere and water on earth sculpture; with the subjects of oceans, continents, lakes, springs, rivers, valleys, mountains, glaciers, volcanoes, earthquakes, etc.; with the structure and classification of the more important rocks; with stratification, joints, shearing, cleavage, faults, mineral veins, dykes, etc.; and with the different geological periods.

4 *Chemistry.*

There is required (*a*) a knowledge of the common elements and their compounds, based upon class-room and laboratory work. This includes the ability to sketch the apparatus used in the laboratory experiments, and to describe the phenomena observed. (*b*) Ability to write equations of simple reactions and to make calculation of the quantities involved in them, atomic weights being supplied. (*c*) Familiarity with the laws of chemical combination, including gases, and with the fundamental atomic and molecular theories.

5 *Physics.*

The examination tests the candidate's familiarity with the general phenomena of mechanics, sound, light, heat, magnetism, and electricity, and his knowledge of the simpler laws governing these phenomena.

6 *German or French.*

Candidates are required to translate at sight prose selections from German or French authors, and to have such knowledge of grammar as will enable them to read the selections intelligently. This implies familiarity with the declensions of nouns, adjectives, and pronouns, with the conjugation and inflection of verbs, and with the syntax of cases. An ability to translate sentences from English into German or French is also requisite. The candidate is at liberty to decide for himself in which of the two languages he will be examined.

7 *English.*

Each candidate is required to write an essay of not less than 800 words on some subject which he himself may select.

8 *Political Economy.*

As much, for example, as is included in Hadley's *Economics* and Jevons' *Money and the Mechanism of Exchange.*

EXAMINATIONS

Examinations for admission to the Forest School will be held in New Haven at Marsh Hall, 360 Prospect St., on Thursday, Friday and Saturday, June 30, July 1 and 2, and on Monday, Tuesday and Wednesday, September 26, 27 and 28, 1904. Attendance is required at 9 A. M. on the opening day of the examinations.

On June 29, 30, July 1 and 2, 1904, examinations will be held at those places in the list given below from which applications are received.

Candidates who propose to take the examinations elsewhere than in New Haven, are required to send their names to Professor Henry S. Graves, Director of the Yale Forest School, New Haven, Conn., before June 1st, 1904. A fee of five dollars, payable at the place of examination, will be charged for admission to the examination outside of New Haven.

Examinations will be held outside of New Haven only when a definite application for an examination in a specified place on the list has been received before June 1st.

List of places where examinations will be given outside of New Haven :

Albany, N. Y., at the Albany Academy ;
Andover, Mass., at Phillips Academy ;
Asheville, N. C., at the Asheville School ;
Auburn, N. Y., at the High School ;
Buffalo, N. Y., at the Central High School ;
Chicago, Ill., at the Bryant & Stratton Business College, northwest corner of Wabash avenue and Congress street ;
Cincinnati, O., at the Hughes High School, 5th street, head of Mound;
Cleveland, O., at the University School ;
Columbus, O., at the University School, 187 East Broad street ;
Concord, N. H., at St. Paul's School ;
Denver, Col., at the East Denver High School ;

Detroit, Mich., at the Central High School;
Easthampton, Mass., at Williston Seminary;
Exeter, N. H., at Phillips Academy;
Garden City, N. Y., at St. Paul's School;
Groton, Mass., at Groton School;
Hartford, Conn., at the Public High School;
Kansas City, Mo., at the Central High School;
Lakeville, Conn., at the Hotchkiss School;
Lawrenceville, N. J., at the Lawrenceville School;
Louisville, Ky., at the Male High School;
Milwaukee, Wisc., at the Milwaukee Academy, 471 VanBuren st.;
Nashville, Tenn., at the Bowen School;
New York City, at the Y. M. C. A. building, 215 W. 23d st.;
Norwich, Conn., at the Free Academy;
Ossining, N. Y., at Dr. Holbrook's School;
Philadelphia, Pa., at the Eastburn Academy, 700 North Broad street;
Pittsburg, Pa., at Shady Side Academy;
Pomfret, Conn., at the Pomfret School;
Portland, Oregon, at the Hill Military Academy;
Pottstown, Pa., at the Hill School;
St. Louis, Mo., at the Board of Education building, corner 9th and Locust streets;
St. Paul, Minn., at the High School;
San Francisco, Cal., at the Urban School, 2124 California street;
Scranton, Pa., at the School of the Lackawanna;
Southborough, Mass., at St. Mark's School;
Tacoma, Wash., at the Tacoma Academy;
Washington, Conn., at The Gunnery;
Washington, D. C., in the Washington Loan and Trust Building, 900 F street, N. W.; inquire at room 101;
Watertown, Conn., at the Taft School;
Worcester, Mass., at Worcester Academy.

CURRICULUM

The regular course covers a period of two years. The subjects have been so arranged that nearly all the preliminary work is completed in the first year. Enough technical Forestry is, however, taught during the first year to enable the students to establish forest plantations, to make improvement thinnings and other classes of cuttings, to make estimates of standing timber, and to assist in the conduct of original research in the growth of trees and forests and in other lines of silvicultural work. The second year is devoted to advanced technical work in the class-room and in the field.

COURSES OF INSTRUCTION

FIRST YEAR

FIRST TERM :—*Introduction to Forestry*—Lectures, 2 hours. *Silviculture*—Lectures, 3 hours. Field Work. *Forest Mensuration*—Lectures, 2 hours. Field Work. *General Morphology of Plants*—Laboratory work and informal lectures, 6 hours. *Forest Botany*—Lectures and laboratory work, 4 hours. Excursions. *Mineralogy*—Laboratory work, 2 to 4 hours. *Federal Forest Reserves*—Twelve lectures.

FIRST HALF SECOND TERM :—*Silviculture*—Lectures, 3 hours. Field work. *Forest Mensuration*—Lectures, 2 hours. Field work. *General Morphology of Plants*—Laboratory work and informal lectures, 6 hours. *Forest Botany*—Lectures and laboratory work, 4 hours. Excursions. *Elementary Petrology*—Lectures, 1 hour. *Meteorology and Forest Physiography*—Lectures, 4 hours. *Forest Hydrography*—Six lectures.

SECOND HALF SECOND TERM :—*Silviculture*—Lectures, 3 hours. Field work. *Physiology of Plants*—Laboratory work and informal lectures, 5 hours. *Forest Botany*—Lectures and laboratory work, 4 hours. Excursions. *Origin and Nature of Soils*—Lectures, 1 hour. *Forest Zoology*—Lectures, 1 hour. *Surveying and Field Engineering*—Field and class-room work, 8 hours.

SECOND YEAR

FIRST TERM :—*Forest Management*—Lectures, 3 hours. Field work. *Forest Technology*—Lectures and laboratory work, 6 hours. *Lumbering*—Lectures, 2 hours. *Forest Protection*—Lectures, 2 hours, *History of Forestry*—Lectures, 1 hour. *Forest Policy*—Six lectures.

FIRST HALF SECOND TERM :—*Forest Management*—Lectures, 2 hours. Field work. *Forest Technology*—Lectures and laboratory work, 6 hours. *Lumbering*—Lectures, 2 hours. *Forest Protection*—Lectures, 2 hours. *Forest Entomology*—Lectures, 2 hours. *History of Forestry*—Lectures, 1 hour. *Forest Administration and Law*—Lectures, 1 hour. *Forest Roads and Trails*—Lectures, 1 hour. *Diseases of Trees*—Lectures, 2 hours. *Fish and Game*—Six to eight lectures. *Forest Engineering*—Field Practice.

SECOND HALF SECOND TERM :—Field work at and near Milford, Pike Co., Penn.

DESCRIPTION OF THE COURSES

1 *General Morphology of Plants.* 1st year, 6 hrs. 1st term and 1st half 2d term.

Dr. EVANS:—

Laboratory work and informal lectures. Beginning with the simplest forms, the various groups of plants are taken up in suitable types, and their structure, development, and mode of life studied and compared.

2 *Plant Physiology.* 1st year, 5 hrs. 2d half 2d term.

Mr. DEAN:—

Chemical composition of plants and soils; formative and metabolic changes of carbohydrates, fats, proteids, and inorganic elements of plants; absorption and transportation of water and food materials; the action of enzymes. A knowledge of the section on Physiology in the Text Book of Botany by Strassburger, Noll and Schimper will be required.

3 *Forest Botany.* 1st year, two half days.

Professor TOUMEY:—

The instruction in Forest Botany includes informal lectures, laboratory and field work. It is expected that the student taking this course has a general knowledge of the science of Botany, hence the work in Forest Botany may be termed Special Botany, dealing particularly with indigenous trees and shrubs, and herbaceous plants which grow in forests. The course embraces Morphology of Plant Organs, with special attention given to them in their winter condition; Anatomy and Histology, with special attention to the origin and development of the tissues of woody plants; Ecology, with particular attention to natural factors influencing the growth of woody plants and forest herbs, and Taxonomy, with special attention to identification and classification of trees and shrubs, and the forest herbs indigenous about New Haven. The work in Ecology and Taxonomy is largely based upon field work, weekly excursions being given throughout the year, except in midwinter.

4 *Diseases of Trees and Timber Preservation.* 2d year, 2 hrs. 1st half of 2d term.

Dr. VON SCHRENK:—

(*a*) Diseases of living trees, wounds and their healing. Diseases induced by animals and man, climate, atmospheric influences. Diseases caused by vegetable parasites. Their economic influence.

(*b*) Decay of structural timber. Lasting powers of various timbers. Seasoning of wood.

(*c*) Timber Preservation. Methods used for preserving timber in Europe and America. Description of preserving plants.

5 *Mineralogy.* 1st year, 2 hrs. 1st term.
Professor PENFIELD and Mr. FORD :—

The instruction in Mineralogy is carried on by means of lectures and practical work in a laboratory specially equipped for the purpose, and is intended to familiarize the student with the common minerals, which are of economic and geological importance. The students have access to a labeled collection, where they can study the properties of the minerals and make comparisons, and also to extensive unlabeled collections, arranged especially to give them practice and facility in the correct identification of minerals.

The course is a preparation for courses 6 and 7.

6 *Elementary Petrology.* 1st year, 1 hr. 1st half of 2d term.
Professor PIRSSON :—

A series of lectures of an elementary nature, and without the use of the microscope, on the characters, origin, and classification of rocks with special reference to their geologic relations and economic properties. Illustrated by collections.

7 *Origin and Nature of Soils.*
1st year, 1 hr. 2d half of 2d term.
Professor PIRSSON :—

The origin and nature of soils with special reference to forests. This course is designed to supplement the previous course and to complete the student's necessary knowledge of rocks and soils. Illustrated by specimens, diagrams, etc.

8 *Meteorology and Forest Physiography.*
1st year, 4 hrs. 1st half of 2d term.
Professor BREWER :—

General conditions necessary to forests; elementary meteorology; forests as related to temperature and its range; to rainfall and its range; to excesses of weather and climate; to the mechanical and chemical nature of soil and ground-water; to the geological character of the surface; to the relief-forms of the land; to other geographical features; the geographical distribution of forests; the relation of physiography to the geographical distribution of species of trees; the reaction of forest upon physiography; the aspects of forests as related to climate and topography; the geological history of forests; and forests in relation to public health and public recreation.

9 *Forest Hydrography.* 1st year, six lectures, 2d term.
Mr. Newell, U. S. Geological Survey:—

Flow of streams; diurnal and seasonal variations; non-periodic fluctuations; regimen of various rivers; effects of forest and cultural conditions on available flow; underground water.

10 *Forest Zoology.* 1st year, 1 hr. 2d half of 2d term.
Dr. Britton, State Entomologist of Connecticut:—

A general course of lectures on Systematic Zoology, dealing especially with economic forms and including such phases of the subject as are most important to the forester.

11 *Forest Entomology.* 2d year, 2 hrs. 1st half of 2d term.
Dr. Britton:—

This course consists of lectures on economic insects with special reference to those which injure forest trees. The chief types are studied by means of specimens and lantern slides, and the most approved methods of combating the attacks of insects are considered. Other topics such as parasitism, special adaptations, relationship of insects, etc., are briefly treated as incidental to the subject.

12 *Forest Entomology.* 2d year, 4 to 6 lectures, 2d term.
Dr. Hopkins, U. S. Department of Agriculture:—

A course of special lectures dealing chiefly with field investigations in the injury to trees and forests by insects.

This course is given every other year. It will not be given in 1903-4.

13 *Surveying and Field Engineering.*
1st year, 8 hrs. 2d half of 2d term.
Professor Tracy:—

This course, consisting of lectures and recitations followed by eks of uninterrupted work in the field, is designed to give the student the training in Surveying and Field Engineering necessary to a forester. Land and topographical surveys are made, plotted, checked, traced, and blue-printed. Levels are run and profiles drawn. Special problems likely to occur in practice are taken up in the field and in the class room.

14 *Forest Engineering.* 2d year, 2d term.

Mr. MARSTON :—

This course is supplementary to Surveying and Engineering 13. It is designed to familiarize the student with rapid methods of rough forest engineering, including topographical sketching, hand leveling, use of barometer, barograph and thermograph, traversing, location and construction of wood roads, and the methods of surveying and mapping used in the U. S. Bureau of Forestry.

The course consists of lectures and field work in the winter term, and of three or four weeks practical work in the regular spring tour of duty of the Seniors in the field.

15 *Forest Roads and Trails.* 2d year, 1 hr. 1st half of 2d term.

Professor BARNEY :—

A course of lectures covering the principles of road construction as far as such knowledge is necessary to a forester.

16 *Introduction to Forestry.* 2 hrs.

(Designed for undergraduates. Optional for Forest School students.)

Mr. AKERMAN :—

This course is designed to give a comprehensive view of Forestry with special reference to its economic aspects. It considers the purpose and scope of Forestry, its importance in national economy, the indirect influence of forests, the relation of the State to forests and Forestry, the need for Forestry and its practice in the United States. It is recommended to undergraduates who desire a knowledge of the nature of Forestry with the view of entering the profession.

17 *Silviculture.* 1st year, 3 hrs., field work additional.

Professor GRAVES, Professor TOUMEY and Assistants :—

Characteristics of forests; the forests of the world; forest regions of the United States; special consideration of trees important in Forestry; methods of research work in Silviculture; methods of reproducing forests naturally; thinnings and other kinds of improvement cuttings.

Forest planting is taught in the spring term by Professor Toumey. Attention is given to the planting and care of trees in streets and parks for ornament and shade, with notes as to the relative suitability of different trees to these uses.

The field work in the fall term is devoted to practice in making forest descriptions and to field studies of the habits and characteristics of local species near New Haven. During the winter term the students are given practice in making reproduction cuttings and all kinds of improvement thinnings. The field work in Silviculture during the spring term is devoted to nursery practice and forest planting.

18 *Forest Mensuration.* 1st year, 2 hrs. 1st term, and 1st half of 2d term, field work additional.

Professor GRAVES and Assistants:—

Methods of determining the contents of felled and standing trees and of whole stands; methods of estimating timber; use of American log scales; determination of diameter, height, and volume increment; the study of forest production including the construction of yield tables.

One day a week during the course is spent in practical work in the woods, and in working up data secured in the field. The students are given practice in the use of cruisers' methods of estimating standing timber, and in the use of the different American log scales. The practical work includes also the accurate determination of the contents of stands for scientific purposes, the collection of data for the construction of tables of contents of standing trees, and for the study of the growth of individual trees and of the future production of whole stands. Practice is also given in the determination of land areas and the construction of maps without the aid of instruments.

19 *Forest Policy.* 1st year, 6 lectures, 1st term.

Professor PINCHOT:—

Origins of forest policy; its objects and principles; legislation and its causes before 1891; legislation and its causes from 1891 to 1903; national organization in Forestry; the forest and other land laws in relation to economic and industrial development; State forest problems.

20 *Forest Management.* 2d year, 2 hrs. 1st term, and 1st half of 2d term, field work additional.

Professor GRAVES:—

Economic principles underlying the management of forest property; a consideration of the ideal or normal forest; the study of forest production, with a discussion of the results of recent research in Europe and Asia, as well as in America; methods of determining the value of forests; the determination of the financial results of Forestry under different conditions; principles and methods of preparing forest working plans, including a study of the methods used in Germany, France, Austria, Switzerland, Italy, Russia, Norway, Sweden and India.

The field work in the fall term includes the preparation of special reports on selected tracts near New Haven, a working plan for a woodlot of not less than 300 acres, and the determination of the value of a selected forest. In the winter term the students are given practice in the use of the methods of making working plans which are employed in other countries. Problems connected with the management of large tracts are dealt with in the field in the spring term.

21 *Federal Forest Reserves.* 1st year, 1st term, 12 lectures.

Professor PINCHOT:—

Economic growth and present industrial situation of the West; settlement and disposal of public lands: origin and management of Forest Reserves; their location and use; detailed descriptions of the Reserves; Government Forests of the Philippine Islands.

22 *Forest Technology.* 2d year, two half days, 1st term, and 1st half of 2d term.

Professor TOUMEY:—

The instruction in Forest Technology includes bi-weekly lectures and work in both the histological and technological laboratories. The course opens with an investigation of the physical properties of the economic woods, and the study of their structural features. In this part of the course special attention is given to the physical and mechanical properties that materially affect the appearance of domestic woods, thus giving them special uses in the arts. These properties are also made the basis for classification and identification of the important woods.

A study is made of the mechanical properties of wood as far as they are of sufficient technological importance. In the investigation of the mechanical properties of all American woods, each student, by original investigation in the well equipped technological laboratory, determines by actual experiment the various strength values of one or more of the commercial woods. The minor forest products that are of sufficient economic importance are also investigated from the technological standpoint. The course terminates with an account of the uses of the different species of woods, and of the minor products of the forest in the industries and arts.

23 *Lumbering.* 2d year, 2 hrs. 1st term, and 1st half of 2d term.

Mr. Marston :—

A consideration from an economic standpoint of the industry in the nation, in the forest regions, and in the individual States ; methods of lumbering with the laws of business applying ; transportation of logs by water and by railroad ; forest road, bridge, and dam construction ; mills and the manufacture of lumber ; pulp manufacture ; secondary products.

The class is required to spend three weeks at the end of the winter term in logging camps under the direction of Mr. Marston.

To supplement this course, special lectures are given in the second term by a number of men engaged in the lumber business in different forest regions of the United States.

24 *Forest Protection.* 2d year, 2 hrs. 1st term, and 1st half of 2d term.

Mr. Marston :—

A consideration of boundaries, titles, deeds, trespass, fire, wind, torrents, drifting sand, insects, fungi, cattle and sheep grazing, etc.; and of legal and practical measures to protect the forest against injury from them, including a consideration of the forest laws of the several States, of the United States, of European countries, and of the Canadian provinces.

25 *History of Forestry.* 2d year, 1 hr. 1st term, and 1st half of 2d term.

Mr. Akei —

abroad and in the United States. Present Foreign Countries.

26 *Forest Administration and Law* 2d year, 1 hr. 1st half of 2d term.

Mr. BOWERS:—

The development of the public domain with reference to the creation of a forest policy by the United States and a consideration of laws relating thereto, including rules and regulations governing public lands, forest reserves and national parks, with references to Federal and State decisions on subjects relating to Forestry.

27 *Fish and Game.* 6 special lectures.

Mr. MARSTON, Professor THEODORE SALISBURY WOOLSEY, New Haven, Conn., Dr. LEONARD C. SANFORD, New Haven, Conn.

The most important fresh-water fish of the United States, their distribution and propagation. Common native birds, their haunts, habits and protection. Large game of the country, its habits, range and usefulness.

OTHER SPECIAL LECTURE COURSES

A number of special lectures are given during the year in connection with the various courses. Two lectures on Lumbering and the Lumber Trade are given in the winter term by Mr. George P. Sawyer of Buffalo, N. Y. Two to four lectures on the History and Practice of Forestry in France will be given in the fall term of 1903 by Mr. George H. Myers of Washington, D. C. It is expected that a number of other special lectures will be given during the year 1903-4.

FIELD WORK

Excursions and field work form an important part of the instruction in Forestry. In the Junior year, three days a week in the fall term, one day a week in the winter term, and three days a week in the spring term are devoted to practical work in the field. The Senior class devotes between three and four months of the college year to field work. Through the courtesy of the New Haven Water Company, Maltby Park, an area of about four hundred acres, has been placed at the disposal of the Forest School. On this tract the students are given instruction and practice in making estimates of timber, in collecting data for the study of the growth and production of native trees, making forest descriptions, marking trees for reproduction and improvement thinnings, preparing forest working plans, tree planting, etc. A number of other tracts near New Haven, which are being managed under systematic forestry, are available for inspection and study. Regular excursions are taken in connection with Forest Botany to train the students in the identification of local species. Frequent excursions are also made by railroad to forest plantations and estates situated near New Haven which are of interest to students of Forestry.

After the Thanksgiving recess, the Seniors are sent into the lumber woods, where they are required to spend three weeks, under the direction of Mr. Marston, studying methods of lumbering and the management of logging operations. The lumber camps of Maine, New Hampshire, the Adirondacks, Michigan, Pennsylvania, North and South Carolina, Florida and Texas have been visited and studied in this way. The students on their return are required to prepare a full report of the conduct of lumbering in the region to which they were assigned.

In the spring term of the second year the entire work is transferred to the field. During the spring of 1902 the Senior class assisted in organizing the forest work on the tract of 12,000 acres owned by Mr. Edward H. Harriman, at Arden, Orange Co., N. Y. In 1903 the Senior field work was carried on at the Military Reservation at West Point, N. Y. In 1904 the work will be conducted at and near Milford, Pike County, Pennsylvania.

This field work is designed to supplement that done in New Haven during the course and to complete the students' training in practical work in the woods. Practice is given in field engineering, including the preparation of a topographic map of a specified tract, the preparation of forest maps, the projection of forest roads, the location of boundaries, and so on. The students are trained in estimating timber, scaling logs, and determining the value of timber lands. Practice is given in making improvement thinnings, and cuttings for natural reproduction. Studies are made of the growth of trees and of whole stands and all methods of research work in silviculture are illustrated by actual work. An important part of the field work is the preparation of a forest-working plan for some private tract. The data for the plan is collected by the class as a whole, and then each student is required to prepare a full working plan report. The best plan then is selected, edited by the instructor in charge and presented to the owner of the forest.

THE SUMMER SCHOOL OF FORESTRY

HENRY S. GRAVES, *Director.*
ARTHUR HARMOUNT GRAVES, *Instructor in Forest Botany.*
———— ————, *Instructor in Forestry.*

SITUATION OF THE SCHOOL

The Summer School of Forestry is located at Grey Towers, the estate of Mr. James W. Pinchot, near the village of Milford, Pike Co., Pa. The place combines the advantages of excellent opportunities for practical forest study and field work and of a pleasant and healthful summer resort. Milford lies on the west bank of the Delaware River, eight miles below Port Jervis, N. Y., whence it is reached by stage running regularly twice a day. Port Jervis is on the direct line of the Erie Railroad. The village has ample accommodations for visitors in a number of comfortable hotels and boarding houses.

The School building stands on a hill overlooking Milford, at an elevation of some 800 feet above sea-level. Less than a quarter of a mile from the School is the picturesque glen of the Sawkill, with the well known Sawkill Falls. Back of the School stretches away a rough, well-wooded country which makes up the wilder part of Pike County, while in front opens a wide propect over the Delaware Valley, bounded by the distant Shawangunk hills.

PURPOSE OF THE SCHOOL

The purpose of the Summer School of Forestry is to provide instruction in Forestry for those who do not wish to take, or who are not ready for, the more advanced technical courses at regular Forest Schools. The course is designed for :

I. Students of Forestry who expect later to enter a more advanced technical school. The training at Milford is of great assistance in preparation for the work at the Yale Forest School.

II. Students who contemplate entering the profession of Forestry, but who are unable to make a definite decision.

III. Advanced students of Forestry who desire to carry on independent research work or to study methods of forest experimentation. The newly established Forest Experiment Station affords excellent facilities for such students.

IV. Owners of woodland. Farmers, lumbermen, and others who wish to obtain a knowledge of the principles of Forestry and a practical acquaintance with the care of woodlands, and with tree planting, will receive instruction to meet their special requirements.

V. Forest Rangers. The course is particularly adapted to persons who wish to fit themselves for work as forest rangers.

VI. Teachers. Instruction in Forestry is now given in a considerable number of Agricultural Colleges, Industrial Schools, and other institutions, both in connection with the study of Horticulture and as separate courses, and it would doubtless form part of the instruction in Botany and Nature Study in public and private schools, if the teachers were properly qualified. The attention of teachers is especially called to the course offered at the Yale Summer School of Forestry.

VII. All persons who desire to acquire a general knowledge of Forestry, or any of its branches.

EQUIPMENT

Through the generosity of Mr. James W. Pinchot the School is thoroughly equipped for the purposes of instruction. The school building contains a large hall capable of seating about 75 persons, which is used for general lectures, and three smaller rooms, two of which are used as laboratories, and the other as a library and reading room. For practical instruction in the field Mr. Pinchot has given the use of a tract of about sixty acres of woodland, and also considerable open ground for tree planting. The forests in the immediate neighborhood offer excellent opportunities for practical study in Silviculture and Forest Botany. One of the Pennsylvania State Forest Reservations is but a short distance from Milford, and will be available for study.

The Milford Forest Experiment Station, which is conducted by the Forest School, is fully equipped for instruction in the methods of advanced research work.

For the accommodation of those who desire to live in camp, tents are furnished by the School, and arrangements are made for board at a reasonable rate. The camp is situated on high, dry ground above the Sawkill in the edge of the woods, a location which is exceedingly healthful.

ADMISSION

Candidates for admission to the Summer School of Forestry must be 17 years or more of age. There are no entrance examinations. Evidence of good moral character will be required.

Since the accommodations are necessarily limited, candidates are advised to make application before May 1, 1904, to Professor Henry S. Graves, Director of the Yale Forest School, New Haven, Conn.

LENGTH OF THE TERM

The School will open July 1, 1904, and continue seven weeks. Students are required to register at the School building not later than 12 M. on Friday, July 1.

FEES AND EXPENSES

The fee for a single session at the School is $25.00. An extra fee of $15.00 will be charged for the use of a School tent. It is expected that the cost of board at the camp will not be over $5.00 per week. Board and lodgings may be had in the village from $6.00 per week upwards.

Information regarding hotels and boarding houses may be obtained by application to Professor Graves.

The railroad fare from New York to Port Jervis is $2.50. A round trip ticket costs $3.60. The stage fare from Port Jervis to Milford is 50 cents.

COURSES OF INSTRUCTION

Five regular courses in Forestry are offered. Students may take any or all of the courses. The studies of those who wish to carry on special research work receive personal direction.

FOREST BOTANY

Mr. ARTHUR H. GRAVES :—

Particular attention is given to Forest Botany. This course embraces laboratory work, field work and lectures. The feature of the course is the field excursions to familiarize the students with the trees near the School, and their habits of growth. The effect of plant parasites upon tree growth, and the part taken by herbage and shrubs in the forest, are also studied in the field.

The laboratory work includes the study of the forest plants of the vicinity.

The lectures cover a systematic account of the trees of the United States, with particular reference to those of importance in Forestry.

SILVICULTURE

Prof. HENRY S. GRAVES :—

The object of this course is to give, as thoroughly as the length of the session will permit, a training in the principles and the practical methods of establishing and treating woodlands. It will consider the characteristics of trees and forests in general, and includes in particular a discussion of the forests of the United States and of the life and habits of the trees important in Forestry. By lectures and field practice the students are trained in the methods of making thinnings for the improvement of the character and composition of the forest, and for the reproduction of the desirable species. Methods of establishing woods by seed and transplanting form an important part of the course.

FOREST MENSURATION

Prof. Henry S. Graves :—

This course takes up in a practical way the methods used in determining the contents of felled and standing trees and of whole forests, the methods of making rough and accurate estimates of standing timber, the use of American log scales, and the methods of determining the age and growth of individual trees and of whole stands.

INTRODUCTION TO FORESTRY

——— ——— :—

The purpose of this course is to explain what Forestry is, and its true scope and function in the United States. The course is presented entirely by lectures, which discuss the Forest, the relation of Forestry to kindred subjects, the auxiliary sciences in their relation to Forestry, and the different branches of technical Forestry in their relation to each other.

Special attention is given to the importance of Forestry in its relation to the public welfare, the forest products of the United States, the consumption and supply of wood and timber, and the effect of forest growth on soil, on climate, and on streams. The course closes with a discussion of National and State forest reservations, the Government in its relation to Forestry, the practice of Forestry in the United States, and Forestry as a profession.

FOREST PROTECTION

——— ——— :—

This course considers forest fires, trespass, damage to forests from wind, insects, grazing, torrents, and drifting sand, and the best means of protection. It is especially recommended to forest rangers.

RESEARCH WORK IN FORESTRY

Prof. Henry S. Graves :—

This course is designed for advanced students who desire to study the work carried on at the Milford Forest Experiment Station or to study the work done in the European Stations. Students wishing to conduct independent investigations are given individual instruction to meet their requirements.

SPECIAL LECTURES

During the season of 1903 a series of special lectures were given by the following men:

Prof. Gifford Pinchot, Forester, U. S. Department of Agriculture, four lectures on State and National Forestry, and on the Forests and Forestry of the Philippine Islands.

Prof. William H. Brewer, on Forest Influence.

Mr. George B. Hollister, Assistant Engineer in the U. S. Geological Survey, on Irrigation and its Relation to Forestry.

Professor James W. Toumey, on Forest Tree Seeds and Seedlings.

It is expected that from four to six special lecturers will be secured for the session of 1904.

FIELD WORK

Practical work in the woods forms an important part of the instruction. In connection with the course in Forest Botany frequent excursions are made to train the students in identifying native and imported trees and shrubs. A large part of the work in Silviculture is devoted to practice in selecting trees for thinnings, in locating reproduction and improvement cuttings and in the study of forest planting. During the course in forest mensuration the students are given abundant practice in studying the growth of trees and whole stands, making estimates of standing timber, etc. In the course in Forest Protection the damage done by fire and other enemies of the forest is illustrated by excursions.

DEPARTMENT OF FORESTRY
(YALE FOREST SCHOOL)

SENIOR CLASS

John Appleton, B.A. Bowdoin College 1902	*Bangor, Me.*	279 Crown st.
Robert Williams Ayres, B.A. Yale University 1903	*Cincinnati, O.*	407 Orange st.
Hugh Potter Baker, B.S. Michigan Agricultural College 1901	*St.Croix Falls, Wisc.*	159 Elm st.
William Hector von Bayer	*Ithaca, N. Y.*	23 Lake pl.
Fred Wilson Besley, B.A. Maryland Agricultural College 1892	*Ashgrove, Va.*	64 Lake pl.
John Henry Bridges, B.S. University of Florida 1902	*Bartow, Fla.*	8 Prospect pl.
Harold Russell Bristol	*Meriden, Conn.*	
Horatio James Brown, B.A. Union University 1901	*Schenectady, N. Y.*	88 Lake pl.
Edward Edgecombe Carter, B.A. Bowdoin College 1902	*Bath, Me.*	70 Whalley av.
Herman Haupt Chapman, B.AGR. University of Minnesota 1899	*St.Paul, Minn.*	188 Dixwell av.
Horace Washburn Chittenden, PH.B. Yale University 1903	*Washington, D. C.*	407 Orange st.
Harold Benjamin Eastman, B.S. Bowdoin College 1902	*Portland, Me.*	25 Whalley av.
Stuart John Flintham	*Albion, N. Y.*	132 Howe st.
Harold Day Foster, B.A. Williams College 1902	*Boston, Mass.*	78 Dwight st.
William Buckhout Greeley, B.L. University of California 1901	*Oakland, Cal.*	78 Dwight st.
Walter Brooke Hadley, B.S. Pacific College 1901	*Dayton, Oregon*	94 Division st.
Ralph Chipman Hawley, B.A. Amherst College 1901	*Amherst, Mass.*	58 Mansfield st.
Yukichi Hokodachi	*Kagoshima, Japan*	30 Court st.
Paul Delmar Kelleter, B.A. Washington University 1902	*St.Louis, Mo.*	30 Tilton st.
William Hoffman Kobbé	*St.Paul, Minn.*	55 Prospect st.
Charles Albert Lyford	*Waverly, N. Y.*	132 Howe st.
Wilbur Reed Mattoon, B.A. Wesleyan University 1899	*Tyrone, N. Y.*	65 York sq.
Hamilton Griswold Merrill, B.A. Amherst College 1900	*Amherst, Mass.*	104 Prospect st.

Allan Bouton Patterson, B.S. Dartmouth College 1898	*Concord, N. H.*	8 Prospect pl.
Allan Raymond Powers, B.S. University of California 1902	*San Francisco, Cal.*	88 Lake pl.
Paul Goodwin Redington, B.A. Dartmouth College 1900	*Evanston, Ill.*	8 Prospect pl.
Avery Turner Searle, B.A. Pomona College 1896	*New Haven, Conn.*	159 Blake st.
Clinton Gold Smith, B.AGR. Conn. Agr. College 1898	*Atlanta, Ga.*	8 Prospect pl.
Manasseh Smith, Jr.	*Portland, Me.*	65 York sq.
Thomas Jackson Taylor, B.A. Chicago University 1894	*New Haven, Conn.*	33 Shelton av.
Blaine Spooner Viles	*Skowhegan, Me.*	70 Whalley av.
William Grant Weigle	*Bendersville, Pa.*	140 Shelton av.

SENIOR CLASS, 32

JUNIOR CLASS

James Fred Baker, B.S. Michigan Agricultural Coll. 1902	*St. Croix Falls, Wisc.*	159 Elm st.
Anton Theophilus Boison, B.A. University of Indiana 1897	*Bloomington, Ind.*	23 Lynwood pl.
Clarence John Buck, B.A. Williams College 1903	*Stockbridge, Mass.*	8 Prospect pl.
James Morton Fetherolf, B.S. Muhlenberg College 1901	*Kempton, Pa.*	88 Lake pl.
Philip Talbot Harris, B.A. Bowdoin College 1903	*E. Machias, Me.*	25 Whalley av.
John Simcox Holmes	*Bowman's Bluff, N. C.*	132 Howe st.
David Golden Kinney	*Utica, N. Y.*	25 Whalley av.
Janero Espina Lagdameo, B.A. Ateneo de Manila 1896	*Manila, P. I.*	94 Division st.
Harold Douglas Langille	*Washington, D. C.*	74 Lake pl.
Jacob Joshua Levison, B.A. College of the City of New York 1902	*New York City*	96 Washington av.
James Patrick McDonough, B.A. Yale University 1903	*New Haven, Conn.*	38 Hallock st.
Charles Arthur Mathewson	*Cincinnati, O.*	182 Mansfield st.
Clayton Dissinger Mell, B.A. Franklin and Marshall College 1902	*Lebanon, Pa.*	59 Prospect st.
Walter Jean Morrill, B.S. University of Maine 1899	*Madison, Me.*	35 Townsend st.
Harry Camble Neel, B.S. Pennsylvania State College 1903	*Dravosburg, Pa.*	182 Mansfield st.
John Marbury Nelson, Jr., B.A. Johns Hopkins University 1903	*Baltimore, Md.*	135 College st.

William Bridge Piper, B.A. Harvard University 1903	*Cambridge, Mass.*	8 Prospect pl.
Merritt Berry Pratt, B.S. Chicago University 1903	*Paw Paw, Ill.*	83 Sachem st.
Samuel James Record, B.A. Wabash College 1903	*Crawfordsville, Ind.*	182 Mansfield st.
Arthur Cuming Ringland	*Montclair, N. J.*	126 Wall st.
Ernest Avery Sanders, M.A. Ohio State University 1903	*Westerville, O.*	606 E. D.
William Forsythe Sherfesee, B.A. College of Charleston 1903	*Charleston, S. C.*	70 Whalley av.
Ferdinand Augustus Silcox, B.S. College of Charleston 1903	*Charleston, S. C.*	70 Whalley av.
Stanton Gould Smith	*Philadelphia, Pa.*	53 Lake pl.
Herbert Osburn Stäbler	*Spencerville, Md.*	53 Lake pl.
Gordon Edwin Tower, B.S. Michigan Agricultural College 1901	*Belding, Mich.*	106 Mansfield st.
Gardiner Watkins, B.A. Princeton University 1903	*New York City*	53 Lake pl.
Lage von Wernstedt, M.E. Institute of Technology, Stockholm 1902	*Strengnäs, Sweden*	142 Sheffield av.
Arnot Wilson Whetstone, M.A. Ohio State University 1903	*Van Buren, O.*	606 E. D.
Trueman Doane Woodbury, PH.B. Brown University 1903	*E. Orleans, Mass.*	42 Lake pl.
Edmund John Zavitz, B.A. McMaster University 1902	*Ridgeway, Ont.*	135 Howe st.
Theodore Christian Zschokke, B.A. Leland Stanford Jr. University 1903	*Palo Alto, Cal.*	53 Prospect st.

JUNIOR CLASS, 32

STUDENTS FROM OTHER DEPARTMENTS

SHEFFIELD, 1904 :—

Ralph Arthur Brown	*Silver Creek, N. Y.*	117 Wall st.
Birdsay Blakeman Pierpont	*Rockford, Ill.*	82 Wall st.
Homer Angelo Rogers	*New York City*	11 B. M. H.

SHEFFIELD, 1905 :—

John Howard Allison	*Granby, Conn.*	27 College st.
Noel Armstrong	*New York City*	120 College st.
Harold Hunter Brown	*Portland, Me.*	120 College st.
James Bond Curtiss	*Buffalo, N. Y.*	128 High st.
John Henry Flood	*Bridgeton, N. J.*	61 Prospect st.
Lauren Allen Kennedy	*Superior, Wisc.*	135 College st.
Argyle Reginald Scott	*LaCrosse, Wisc.*	1151 Chapel st.
Chester Nathan Whitney	*Morristown, N. J.*	111 Grove st.